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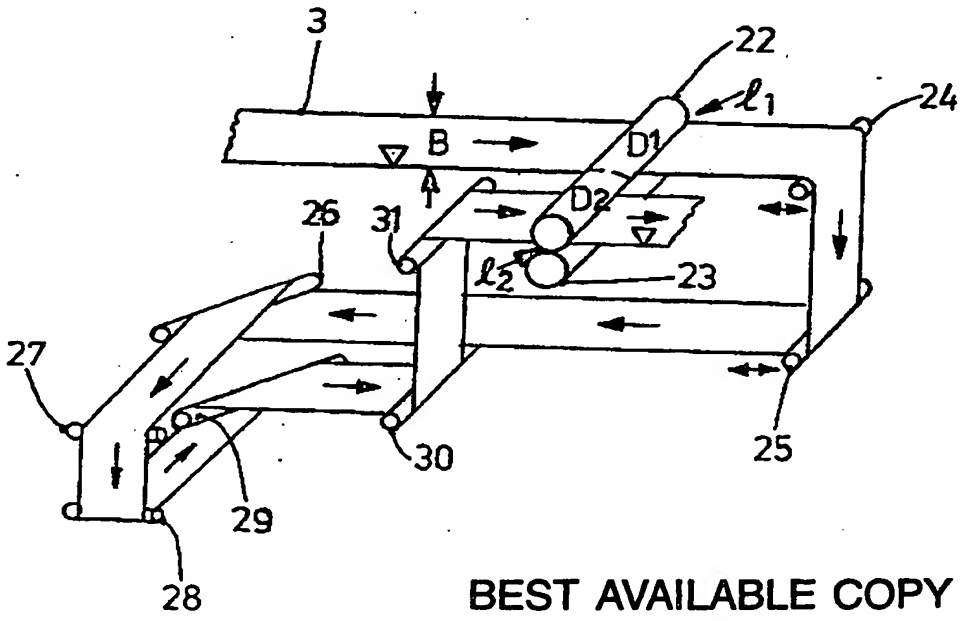
(54) Printing on webs

(57) A continuous print is produced on a half-width web (3) using one printing unit. After the first pass between the two printing cylinders (22,23) the web is guided around a return loop in which it is laterally displaced and is then conveyed a second time between the same cylinders (22,23). On the first pass successive first images (D1) are printed and on the second pass successive second images (D2) are printed; the length of each image (D1 and D2) is equal to half the circumference of the cylinders (22,23) (or the sum of the image lengths is equal to the full circumference) and the length of the return loop (l_1–l_2) is fixed at an odd numbered multiple of the image lengths, so that the printed images (D1, D2) follow one another on the web without a gap. The loop length adjustment is made by means of displaceable rollers (24,25). If continuous printing on one side only is required, the cylinder 23 may be an impression cylinder. The image lengths may be made longer so that partial overprinting occurs. The edges of the images should be non-straight to make the joins between adjacent images less noticeable. The printing cylinders (22,23) may be offset cylinders applied with an image from plate cylinders.

Fig.3



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SPECIFICATION

Web-fed rotary printing machine and method for continuous printing

This invention relates to a web-fed rotary printing machine with at least one printing unit, in which a part-width i.e. a web of a width not exceeding half the length of the printing cylinder, can be printed on one or on each side, and to a method of so printing a web.

An object of the invention is to provide a rotary printing machine of the above-mentioned type in which with one single printing unit a part-width web can be printed continuously along its length, i.e. without interruptions (gaps) in the printed matter.

According to one aspect of the present invention, there is provided a web-fed rotary printing machine having at least one printing unit comprising at least one printing cylinder and impression cylinder pair which, in use, is adapted to print, with different longitudinal portions of the cylinder surfaces not exceeding half the length of the printing cylinder, respectively first and second images to be printed, means for guiding a part-width web of a width not exceeding half the length of the printing cylinder, between the cylinder pair whereby it can be printed with successive first images, means for laterally displacing the web by at least its own width after it has passed between the cylinder pair and for guiding the web along a return path loop so as to pass it again between the cylinder pair for printing successive second images on the same side of the web as that on which the first images are printed, and means for adjusting the path length of the return loop so that the second image printings are in the longitudinal portions of the web between the successive first image printings.

According to another aspect, the invention provides a method of printing a continuous web in a web-fed printing machine, wherein successive first images are printed by means of a printing cylinder and impression cylinder pair onto a part-width web of a width not exceeding half the length of the printing cylinder, and passing the web around a return loop and again between the printing and impression cylinder pair after laterally displacing it by at least its own width, to print in the gaps between the successive first image printings successive second images.

The printing machine may be adapted to print a half-width web the width of which corresponds approximately to half the printing cylinder length and so that the web is printed continuously along its printed surface without interruptions (gaps).

To achieve continuous printing without overlapping, i.e. without overprinting of part of the images, the length of the first and second images should each coincide with half the printing cylinder circumference or the sum of the first and second image lengths should be equal to the full circumference of the printing cylinder.

The printing cylinder may be the blanket cylinder of an offset printing unit for first forme (one-sided) printing, or, if both sides of the web are to be printed continuously, the two blanket cylinders of a first and second forme offset printing unit may be used, each blanket cylinder serving additionally as the impression cylinder for the other blanket cylinder.

To make the joins between the first and second image printings less noticeable than would be the case with straight joins extending transversely across the web, the leading and trailing edges of the first and second images may be inclined to the cylinder axes and/or may be ragged serrated or of other non-straight configuration.

The invention may be put into practice in a number of ways but two specific embodiments will now be described by way of example with reference to the drawings, in which:—

Figure 1 is a schematic representation of a web-fed offset rotary printing machine for the first and second forme printing in accordance with the invention;

Figure 2 is a similar printing machine but for first forme printing;

Figure 3 is a schematic representation of a device for the lateral displacement of the web; and

Figure 4 is an image sequence on a printed web.

Fig. 1 shows an indentation unit 1 from which a half-width web 3 coming from a delivery spool is conveyed to a conventional printing unit 4 for first and second forme printing. The expression "half-width web" means that the web 3 is only half as wide as the machine width of the cylinders 5 to 8 used in the printing unit 4, i.e. the web width is equal to half the axial length of the printing cylinders 5 to 8.

The printing unit 4 comprises two conventional pairs of plate and blanket cylinders 5, 6 and 7, 8. The grooves needed for receiving the securing means for the plate and rubber blankets are merely indicated by box-shapes within the circumference but are not referenced in Figs. 1 or 2. It is because of these grooves that the web 4, passing only once through the printing unit 4, cannot be printed continuously—i.e. without interruption in the printing along the web—because the arcuate section needed for the grooves on the circumference of the cylinders 5 to 8 is lost for the print transfer.

Hitherto known web-fed offset rotart printing machines for the continuous double-sided printing of paper or material webs use an

oversized impression cylinder and two smaller blanket cylinders co-operating with an equally large plate cylinder, which blanket cylinders receive, on one part of their circumference, the image to be transferred; the two blanket cylinders are arranged at a specific distance from one another on the impression cylinder, taking into account the image length obtaining on the circumference, and the web is conveyed between each blanket cylinder and the common impression cylinder. Thus, in practice two printing units, viz. two blanket cylinders and two plate cylinders, are needed each with a damping and an inking device.

In accordance with the invention, the printing machine of Fig. 1 offers the possibility of producing uninterrupted printing on one side of the web 3 by means of a single pair of cyinders. Through the use of the second pair of cylinders 7,8 a continuous printing can also be produced on the other side. The machine according to Fig. 1 this makes it possible to print continuously on both sides of the web 3, i.e. continuous first and second forme printing.

After the first pass of the web 3 through the printing unit 4 between the cylinders 6 and 7 the web is conveyed over a paper carrying roller 9, which conventionally must be swivellable or otherwise displaceable, as is the case, for example, with conventional ajusting rollers, and then via further paper carring rollers 10 and 11 to a web shifting device 12. With this device 12, which is explained more fully below, the web 3 is laterally shifted by at least the width B (Fig. 4) of the web 3, without turning it over relative to its orientation during the first pass, after which the web 3 is passed for a second time between the blanket cylinders 6 and 7 of the printing unit 4.

With the the aid of the paper carrier roller 9 working as an adjusting roller, the return loop of the web 3 is so measured that the gaps remaining after the first pass of the web are printed on the second pass so that the gap section length is equal to printing length. The paper carrier roller 9 is so shifted or swivelled in the direction of the arrow by conventional devices that are not shown, that on the second pass the imsge D2 to be printed comes into position with its beginning and its end exactly between the end and the beginning of two successive images D1 produced in the first pass. To achieve this the plate cylinders 5 and 8 are provided with printing plates on which the images D1, D2 occupy respectively only half the cylinder circumference U/2. If a specific partial overlap of the images is desired it is also possible to select the combined length of both the images D1, D2 to be somewhat greater than the cylinder circumference U. This can produce advantageous colouring effects, particularly when using such a machine to print wallpaper.

In addition, it is preferred that the joint between the two overprintings does not lie completely at U/2; possibly during the second passage only the remaining cylinder gap of the first print is closed, e.g. where the first image covers most of the printing cylinder circumference apart from the section for the securing means, and the second image merely covers a length equal to that section i.e. D1 is greater than D2. Also the line of the join i.e. the leading and/or trailing edges of the images, should not be straight and transverse to the machine direction but, in a way that is best adapted to the resulting printed subject, can be inclined to the cylinder axes, and/or be ragged or serrated or of any other non-straight configuration, so that the join is less noticeable.

It will be understood that when using printing machines in accordance with the invention, the plate cylinders 5 and 8 carry two images D1 D2 lying on different portions next to one another in the axial direction of the cylinders, which images may either be identical or different, and the first image D1 is always transferred during the first pass between the first portions of the blanket cylinders, and the second image D2 during the second pass to fill the gaps remaining after the first printing.

Fig. 2 shows a web-fed rotary printing machine for first forme printing which comprises an indentation unit 13, via which the web 3 coming from a delivery spool 14 is conveyed to a printing unit 15. The printing unit 15 comprises a plate cylinder 16 a blanket cylinder 17 and an impression cylinder 18. When the web 3 has passed through the printing unit 15 for the first time, it is conveyed to a web shifting device 21 via paper carrier rollers 19 and 20 working as path length adjusters, in which device the web 3 is shifted laterally by the paper web width B and is conveyed a second time to the printing unit 15. The arrangement of the images on the plate cylinder 16 and hence on the blanket cylinder 17 is in principle identical with the arrangement according to the printing machine of Fig. 1.

Fig. 3 shows a device consisting of conventional paper carrier rollers for the lateral shifting of the web 3 which can be used in the machines shown in Figs. 1 and 2. The blanket cylinders 22 and 23 used as image transfer cylinders carry two images D1 and D2 next to one another in the axial direction of the cylinders. During the first pass of the web 3 of width B equal to half the lengths of the cylinders 22, 23, first of all successive first images D1 are transferred, and after the passage of the web via the shifting device successive second images D2 are printed. As already explained, by a corresponding arrangement of the image lengths, for example, so as to be equal to respectively half the blanket cylinder

circumferences, the gapless, i.e. uninterrupted, printing shown in Fig. 4 can be produced.

Explaining the lateral shifting of the web in more detail, after the web 3 has passed between th blanket cylinders 22 and 23 for the first time, it is conveyed via displaceable paper carrier rollers 24 and 25 to a reversal rod 26 which is disposed at an angle of 45° relative to the travel direction of the web 3 through the machine, so that the web 3 is now guided at right angles to its original travel direction. After the web 3 has passed over further paper carrier rollers 27 and 28, there is again a reversal of direction at a reversal rod 29, which is arranged parallel to but in another plane with respect to the reversal rod 26. By means of the reversal rod 29, the web 3 is again guided parallel to its original direction, so that after being guided over further paper carrier rollers 30 and 31, it can pass between the blanket cylinders 22 and 23 a second time, laterally displaced relative to the path of the first pass, and the successive second images D2 are transferred to the web.

The length of the paper web return loop 1_1 to 1_2 extending from the printing line and back to it must be set at an odd number multiple of the image length or an odd number multiple of half the circumference U/2 of the cylinders 22 and 23, by means of the displaceable paper carrier rollers 24 and 25, so as to produce an uninterrupted print. This ensures that the trailing edge of D1 coincides with the leading edge of D2 and the trailing edge of D2 coincides with the leading edge of D1 without a gap.

Whilst the above embodiments relate to continuous printing of a half-width web, it might be possible to apply the same principle to print a part-width web of, say, 1/3 (or $\frac{1}{4}$) of the printing cylinder length and arranging for it to pass three (or four) times between the printing and impression cylinders with lateral web shifting after each pass.

CLAIMS

1. A web-fed rotary printing machine having at least one printing unit comprising at least one printing cylinder and impression cylinder pair which, in use, is adapted to print, with different longitudinal portions of the cylinder surfaces not exceeding half the length of the printing cylinder, respectively first and second images to be printed, means for guiding a part-width web of a width not exceeding half the length of the printing cylinder, between the cylinder pair whereby it can be printed with successive first images, means for laterally displacing the web by at least its own width after it has passed between the cylinder pair and for guiding the web along a return path loop so as to pas it again between the cylinder pair for printing successive second images on the same side of the web as that on which the first images are printed, and means for adjusting the path length of the return loop so that the second image printings are in the longitudinal portions of the web between the successive first image printings.

2. A printing machine as claimed in claim 1, which is adapted to print a half-width web the width of which corresponds approximately to half the printing cylinder length and so that the web is printed continuously along its printed surface without interruptions (gaps).

3. A printing machine as claimed in claim 1 or claim 2, in which the printing and impression cylinder pair is adapted so that the length of each image coincides respectively with half the printing cylinder circumference or the sum of the first and second image lengths is equal to the circumference of the printing cylinder.

4. A printing machine as claimed in any one of the preceding claims, in which the printing cylinder is the blanket cylinder of an offset printing unit for first forme (one-sided) printing.

5. A printing machine as claimed in any one of claims 1 to 3, in which the printing and impression cylinder pair are constituted by two blanket cylinders of an offset printing unit for first and second forme (two-sided) printing, each blanket cylinder, in addition to constituting a printing cylinder, also serving as the impression cylinder in cooperation with the other blanket cylinder.

6. A printing machine as claimed in any one of the preceding claims, in which the leading and/or trailing edges of the first and second images are inclined to the cylinder axes and/or are ragged, serrated or of other non-straight configuration so as to produce on the printed web first and second image printings the joins between which are less noticeable than straight joins transverse of the web.

7. A method of printing a continuous web in a web-fed printing machine, wherein successive first images are printed by means of a printing cylinder and impresssion cylinder pair onto a part-width web of width not exceeding half the length of the printing cylinder, and passing the web around a return loop and again between the printing and impression cylinder pair after laterally displacing it by at least its own width, to print in the gaps between the successive first image printings successive second images.

8. A method as claimed in claim 7, wherein the web is a half-width web the width of which corresponds approximately to half the printing cylinder length, and wherein the web is printed continuously along its printed surface without interruptions (gaps).

9. A method as claimed in claim 7 or claim 8, wherein the first and second images coincide respectively with half the printing cylinder circumference, or the sum of the

image lengths is equal to the circumference of the printing cylinder.

10. A method as claimed in any one of claims 7 to 9, wherein the web is printed on one side only, the printing cylinder being the blanket cylinder of an offset printing unit.

11. A method as claimed in any one of claims 7 to 9, wherein the web is printed on both sides with respective first and second image printings for each side by means of two blanket cylinders of an offset printing unit, each blanket cylinder constituting a printing cylinder and also serving as an impression cylinder for the other blanket cylinder.

12. A method as claimed in any one of claims 7 to 11, wherein the leading and/or trailing edges of the first and second images are inclined to the cylinder axes and/or are ragged, serrated or of other non-straight configuration so that the joins between adjacent edges of the first and second image printings on the web appear less discernible than straight joins transverse of the web.

13. A web-fed rotary printing machine substantially as specifically described herein with reference to Fig.1 or to Fig. 2, with Fig. 3, of the accompanying drawings.

14. A method of printing a web in a web-fed rotary printing machine, substantially as specifically described herein with reference to Fig. 1 or to Fig. 2, with Figs. 3 and 4, of the accompanying drawings.

15. A web printed in a web printing machine as claimed in any one of claims 1 to 6 or in claim 13.

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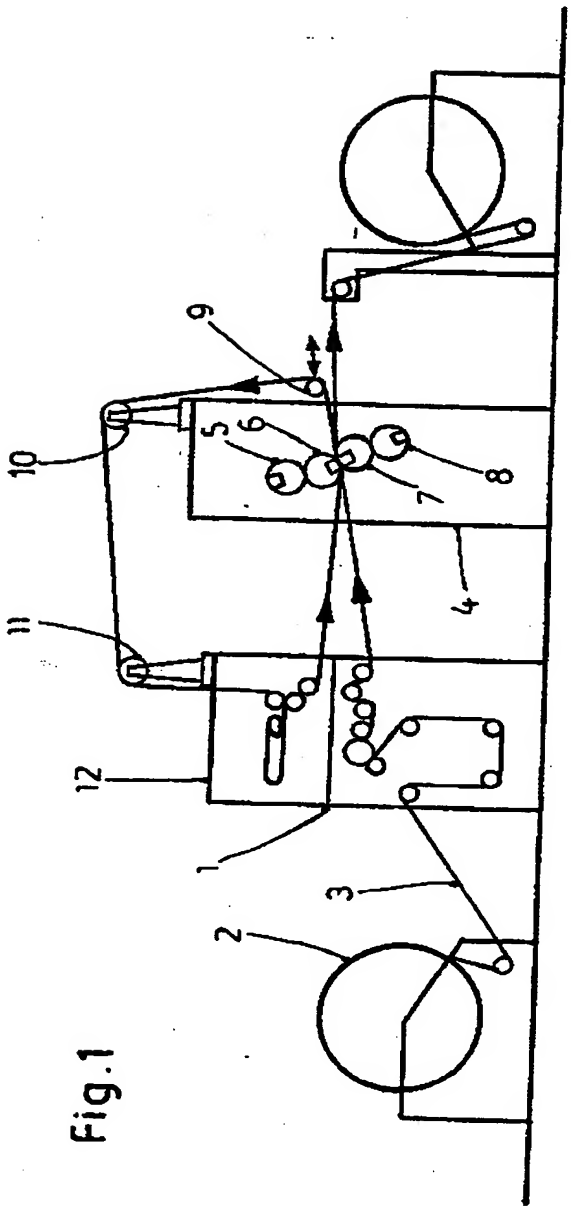


Fig.1

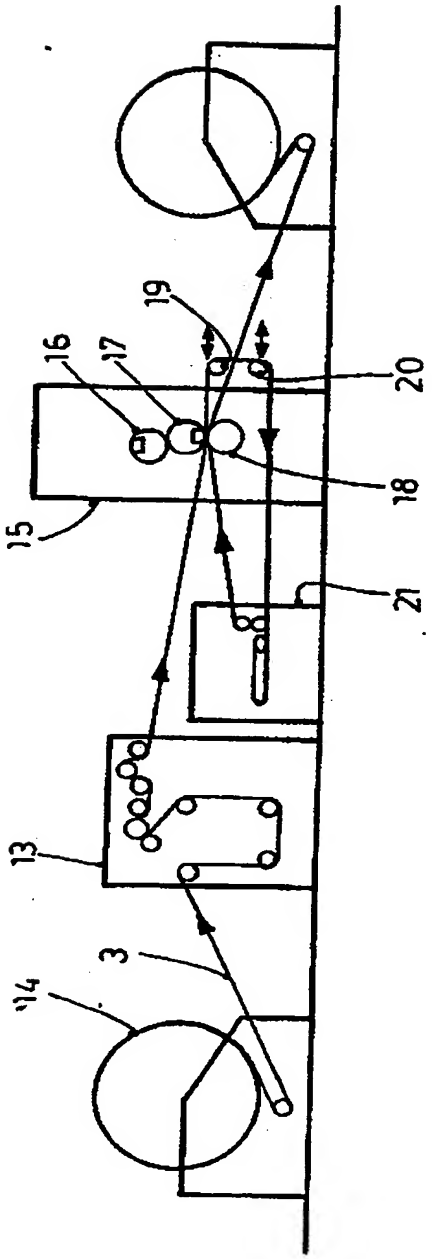
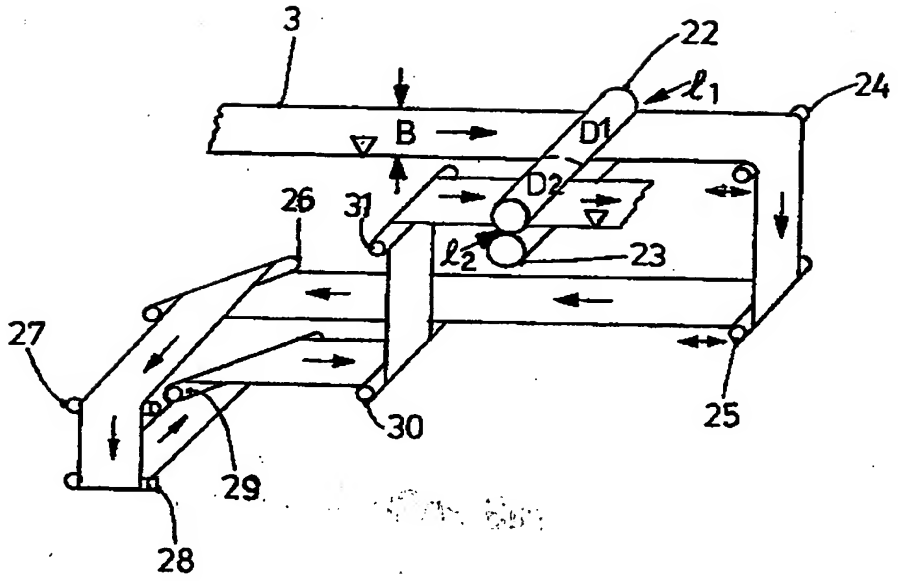


Fig.2

Fig.3


3
22
ℓ_1
24
B
D1
D2
26
31
ℓ_2
23
27
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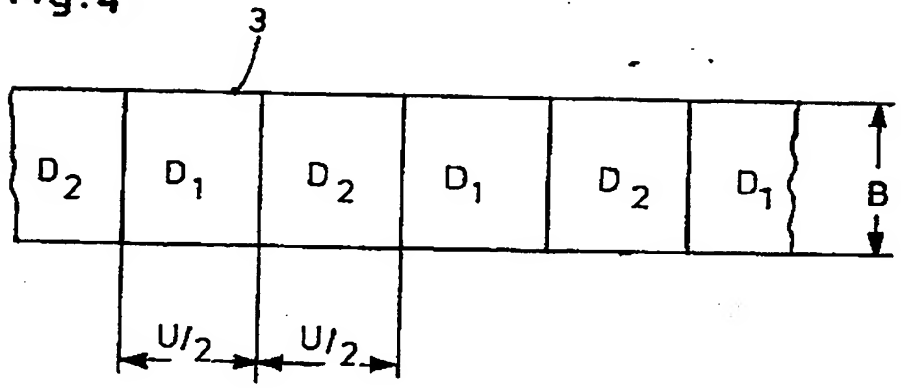
25
29
28

Fig.4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